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ABSTRACT

The purpose of this tutorial is to provide the basic information needed for success with SPSS/PC+ Studentware, a student version of the statistical analysis software offered by SPSS, Inc., for the IBM PC+ and compatible computers. It is intended as a convenient summary of how to organize and conduct the most common computer-based statistical analyses. Students experienced with DOS-based personal computers will be familiar with the procedures presented in this tutorial; however, all DOS commands needed for successful use of SPSS/PC+ Studentware are presented in the tutorial. Topics included in this guide are: Getting started; Making a data diskette; Making a command file; Measures of Central Tendency and Dispersion; t-test; Chi-square test; Oneway ANOVA test; Twoway ANOVA test; and Installing SPSS/PC+ Studentware on a hard disk. (Contains 2 references.) (ALF)

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Doctor of Arts
Computer-Based Learning

A TUTORIAL FOR SPSS/PC+ STUDENTWARE

Study Guide

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A TUTORIAL FOR SPSS/PC+ STUDENTWARE

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October, 1989

PURPOSE

The purpose of this tutorial is to provide the basic information needed for success with SPSS/PC+ Studentware. The tutorial is not a replacement for the documentation provided in the related text. On the contrary, the tutorial is presented instead as a convenient summary of how to organize and conduct the most common statistical analyses through the use of SPSS/PC+ Studentware, a student version of the highly useful statistical analysis software offered by SPSS, Incorporated.

ORIENTATION

It is recognized that many students have had minimal experience with statistical analysis, and even less experience with computer-based statistical analysis. This tutorial, in conjunction with SPSS/PC+ Studentware, will serve as a useful introduction to computer-based statistical analysis.

PREREQUISITES

Students experienced with DOS-based personal computers (i.e., IBM-type machines and similar clones) will be familiar with the procedures presented in this tutorial.

OVERALL INSTRUCTIONS

The tutorial and related text (Norusis, 1988) should be reviewed before attempting the statistical tests presented in the tutorial. Students with minimal DOS experience should also become familiar with the disk operating system for IBM-type personal computers. However, all DOS commands needed for successful use of SPSS/PC+ Studentware are presented in the tutorial.

DETAILED INSTRUCTIONS

Examples of how the most common statistical tests can be conducted by use of SPSS/PC+ Studentware are presented in the tutorial. In these examples, data are included in the command file. Detailed instructions are also provided on how to use DOS to rename and print SPSS/PC+ Studentware files.

GOALS

After using this tutorial, each student will:

1. Use appropriate statistical analysis without hesitation, due to familiarity with the convenient use of computer-based statistical analysis.
2. Become familiar with the concepts of data organization and

data presentation, regardless of the processes used to conduct later statistical analyses.

3. Develop basic skills with SPSS commands through the use of SPSS/PC+ Studentware so that later use of SPSS-X will be a simple transition.

OBJECTIVES

After using this tutorial, each student will be able to:

1. Use DOS to make a self-booting data disk for use with SPSS/PC+ Studentware
2. Use the SPSS/PC+ Studentware editor to create a command file.
3. Use SPSS/PC+ Studentware to retrieve (and use) a previously created command file.
4. Use the appropriate SPSS/PC+ Studentware commands to conduct the following statistical analyses:
    A. Measures of central tendency (mean, median, mode)
    B. Measures of dispersion (variance and standard deviation)
    C. Student's t-test
    D. Chi-square
    E. One Way ANOVA, including mean comparison techniques
    F. Two Way ANOVA

REVIEW QUESTIONS

Before you use this tutorial, think about how you would respond to the following:

1. As part of your regular professional responsibilities, are you involved in statistical analysis? If not, do you see how your professionalism could be enhanced through the appropriate use of statistical analysis?
2. Have you ever avoided the use of statistical analysis because of the mathematical complexity of the many tests? Is it possible that you have avoided statistics because of mathematics?
3. Have you ever used computers and concomitant software to conduct a statistical analysis? Did you understand how and why the data were organized? Did you understand the result? Were you able to use the computer-based process to examine the data from a wide variety of perspectives?

USE OF SPSS/PC+ STUDENTWARE

To prepare a data diskette for a floppy-based system (two 5.25-inch disk drive), boot your system from drive A (use DOS 3.0 or greater) and follow these steps:

```
====================
= Getting started =
====================

Place the DOS diskette into drive A.
Turn on the machine.
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
+      Note: The 'A>' and 'C>' prompt indicates DOS commands.   +
+            The 'SPSS/PC:' prompt indicates SPSS/PC+ commands. +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Making a data diskette

Step 1, place a new diskette in drive B.

Step 2, type:

```
A> format b: /s     << This will format and create >>
                    << a new bootable diskette.    >>
```

Step 3, put away your original DOS diskette.

Step 4, take the new bootable diskette out of drive B and place it in drive A.

Step 5, place diskette C4 in drive B. (If you are using 3.5-inch diskettes, place diskette C3 in drive B).

Step 6, type:

```
A> copy b:config.sys a: << This will copy the    >>
                        << config.sys file into  >>
                        << the new bootable data >>
                        << diskette.             >>
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Note: You must have the config.sys file on the diskette used  +
+       to start the system to run SPSS/PC+ Studentware.        +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Now you have created a Studentware data diskette. You will not need to create another data diskette until the diskette capacity is exceeded.

Making a Command File

Place:

bootable data diskette in drive A.
Studentware's C1 diskette in drive B.

Turn on the machine.

You will now receive instructions on how to make a command file called grade.dat.

Step 1, type:

```
A> b:review grade.dat  << In this example, grade.dat >>
                       << is the name of the command >>
                       << file. Press return.        >>
```

At this point the system will ask for the C5 disk (if you are using 5.25 inch disks).

Step 2,

Place the C5 disk in drive B and press the return key.

At this point the screen will be blank and the following message will be displayed on the bottom of the screen, waiting for action.

```
┌──────────────────────────────────────────────────────────────┐
│                                                              │
│                                                              │
│                                                              │
```

columns 11 - 13; Sue, columns 16 - 18; Bea, columns 21 - 23. (Remember, this is what you would type beginning with the first line. And, remember that columns are vertical and rows are horizontal).

For this example, the command file (grade.dat) was typed as:

```
DATA LIST /
       Tom             01-03
       Bob             06-08
       Roy             11-13
       Sue             16-18
       Bea             21-23.

variable labels
     Tom          "Thomas R. O'Callish"
     Bob          "Robert E. Lee, IV"
     Roy          "Leroy G. Anglesh"
     Sue          "Susan V. Douglas"
     Bea          "Beatrice H. Malcolm".

begin data.
089  091  081  081  083
091  081  071  089  100
091  065  045  081  092
082  071  062  079  081
072  067  091  085  094
end data.
```

Now you have finished creating the command file.

Step 4, press function key 'F9'.

The command 'write Whole file' is highlighted on the bottom of the screen. Press the 'return' key to execute this command.

At this point, REVIEW asks you to confirm that you still want to call the file grade.dat, or whatever name you used. If you do, just press the 'return' key again, or type another name if you have changed your mind.

Step 5, press function key 'F10' to get out of REVIEW.

At this point, the command 'Exit to prompt' is highlighted on the bottom of the screen. Press the 'return' key to execute this command. You are now back to the DOS prompt.

```
==================================
= Central Tendency and Dispersion =
==================================
```

Place your data diskette in drive A and Studentware's C1 diskette in drive B. (You will always start the system using these diskettes).

Step 1, at the DOS prompt, type:

```
        A> b:student          << This runs the SPSS/PC+ >>
                              << Studentware program.  >>

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Note: After you get into SPSS/PC+ Studentware, the system +
+       creates a file called spss.lis for recording all of +
+       your work.                                           +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Step 2, type:

```
        SPSS/PC:include 'grade.dat'.
                              << This reads in the command  >>
                              << file called grade.dat that >>
                              << was previously created.    >>
```

At this point, the system will give some messages. After the messages end go to step 3.

Step 3, type:

```
        SPSS/PC:frequencies variables = Tom /statistics all.
                          << This generates all statistics  >>
                          << values for the variable "Tom". >>
```

<< Then, press return. >>

At this point, the system will ask for the C2 diskette.

Step 4:

Place the C2 disk in drive B, press the return key.

You now have a table with all statistics values for the variable "Tom". (Press the space bar when MORE shows at the top of the screen).

Step 5, type:

```
SPSS/PC:finish    << This is the command to exit >>
                  << SPSS/PC+ Studentware.       >>
```

You are now back to the DOS prompt.

Step 6, type:

A> rename spss.lis grade.lis

This will change the file name from spss.lis to grade.lis. Otherwise you may lose your previous work when you go into SPSS/PC+ Studentware again.

Step 7, type:

A> type grade.lis

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ Note: Press the Ctrl key down and also the p key to direct+
+       the file to the printer. After you do this routine, +
+       take your fingers off the keys. Then, press the     +
+       return key. The file will now print at the printer. +
+                                                           +
+       Press the Ctrl key down and also the p key to turn  +
+       off the printer at the end of printing.             +
```

++

The following is the result for this example.

```
TOM       Thomas R. O'Callish

  Value Label          Value  Frequency  Percent  Valid Percent  Cum Percent

                          72          1     20.0           20.0         20.0
                          82          1     20.0           20.0         40.0
                          89          1     20.0           20.0         60.0
                          91          2     40.0           40.0        100.0
                                -------  -------        -------
                       TOTAL          5    100.0          100.0

Mean          85.000     Std Err       3.647     Median        89.000
Mode          91.000     Std Dev       8.155     Variance      66.500
Kurtosis        .901     S E Kurt      2.000     Skewness      -1.328
S E Skew        .913     Range        19.000     Minimum       72.000
Maximum       91.000     Sum         425.000

Valid Cases       5      Missing Cases     0
```

```
==========
= t-test =
==========
```

Assuming that you are comfortable with entering the data using the "review" editor you can go directly to the t-test routine. The following is the command file called shift.dat.

```
DATA LIST
     / ID         01-02
       Shift        04
       Days_Off   06-07.

variable labels
       ID          "Employee ID for the Study"
       Shift       "Shift Worked"
       Days_Off    "Number of Sick Days per Year".

value labels
       Shift       1 'Night'
                   2 'Day'.
```

```
begin data.
01 1 21
02 1 10
03 1 14
04 1 33
05 1 07
06 1 02
07 1 19
08 1 06
09 1 04
10 1 12
11 2 13
12 2 05
13 2 16
14 2 00
15 2 07
16 2 18
17 2 17
18 2 03
19 2 24
20 2 01
end data.
```

Step 1, type:

```
A> b:student          << This runs the SPSS/PC+ >>
                      << Studentware program.   >>
```

Step 2, type:

```
SPSS/PC:include 'shift.dat'.
                          << This reads in the command  >>
                          << file called shift.dat that >>
                          << was previously created.    >>
```

At this point, the system will give some messages. After the messages end go to step 3.

Step 3, type:

```
SPSS/PC:t-test groups = Shift(1,2) /variables = Days_Off.
                         << This executes the t-test>>
                         << routine. Shift and      >>
                         << Day_Off indicates       >>
                         << variable names.         >>
```

At this point, the system will ask for the C2 diskette.

Step 4:

Place the C2 disk in drive B and press the return key.

The result will be saved into the file called spss.lis. (Press the space bar when MORE shows at the top of the screen).

Step 5, type:

```
SPSS/PC:finish    << This is the command to exit >>
                  << SPSS/PC+ Studentware.       >>
```

You are now back to the DOS prompt.

Step 6, type:

```
A> rename spss.lis shift.lis
```

This will change the file name from spss.lis to shift.lis. Otherwise you may lose your previous work when you go into SPSS/PC+ Studentware again.

Step 7, type:

```
A> type shift.lis
```

You have finished the t-test routine. The following is the result for this example.

Independent samples of SHIFT Shift Worked
Group 1: SHIFT EQ 1 Group 2: SHIFT EQ 2

t-test for: DAYS_OFF Number of Sick Days per Year

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	10	12.8000	9.414	2.977
Group 2	10	10.4000	8.276	2.617

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.29	.707	.61	18	.552	.61	17.71	.553

```
==================
= Chi-Square test =
==================
```

Assuming that you are comfortable with entering the data using the "review" editor you can go directly to the Chi-Square test routine. This analysis is based on the following:

		Columns = Hair	
		Light=1	Dark=2
Rows = Eyes	Light=1	(a) n = 31	(b) n = 21
	Dark=2	(c) n = 14	(d) n = 34

Thus, you will have:

```
31 entries coded 1 1 (light eyes and light hair)
21 entries coded 1 2 (light eyes and dark hair)
14 entries coded 2 1 (dark eyes and light hair)
34 entries coded 2 2 (dark eyes and dark hair).
```

The following is the command file called color.dat.

```
DATA LIST
     / Eyes       1
       Hair       3.
```

```
variable labels
       Eyes        "Eye Color"
       Hair        "Hair Color".

value labels
       Eyes        1 'Light Eyes'
                   2 'Dark Eyes' /
       Hair        1 'Light Hair'
                   2 'Dark Hair'.

begin data.
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
1 1
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1 2
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```

```
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```

```
2 2
2 2
2 2
2 2
2 2
2 2
2 2
2 2
end data.
```

Step 1, type:

```
        A> b:student          << This runs the SPSS/PC+ >>
                              << Studentware program.   >>
```

Step 2, type:

```
        SPSS/PC:include 'color.dat'.
                              << This reads in the command  >>
                              << file called color.dat that >>
                              << was previously created.    >>
```

At this point, the system will give some messages. After the messages end go to step 3.

Step 3, type:

```
        SPSS/PC:crosstabs tables = Eyes by Hair /options 14 15
                /statistics 1.
                              << This executes the Chi-Square >>
                              << analysis (rows by columns).  >>
                              << "Eyes" and "Hair" indicates  >>
                              << variable names.              >>
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+       Note: Use the space bar to move to the next line.      +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

The option number tells SPSS/PC+ Studentware to calculate the expected cell frequencies and the residuals. Option 14 is for expected cell frequencies, and Option 15 is for residuals. Statistic 1 tells SPSS/PC+ Studentware to compute the Chi-Square test.

At this point, the system will ask for the C2 diskette.

Step 4:

Place the C2 disk in drive B, press the return key.

The result will be saved into the file called spss.lis. (Press the space bar when MORE shows at the top of the screen).

Step 5, type:

```
SPSS/PC:finish    << This is the command to exit >>
                  << SPSS/PC+ Studentware.       >>
```

You are now back to the DOS prompt.

Step 6, type:

```
A> rename spss.lis color.lis
```

This will change the file name from spss.lis to color.lis. Otherwise you may lose your previous work when you go into SPSS/PC+ Studentware again.

Step 7, type:

```
A> type color.lis
```

You have finished the Chi-Square test routine. The following is the result for this example.

```
Crosstabulation:      EYES          Eye Color
                   By HAIR          Hair Color

              Count   |Light Ha|Dark Hai|
   HAIRD>     Exp Val |ir      |r       |   Row
              Residual|      1 |      2 |  Total
```

EYES				
Light Eyes	1	31 23.4 7.6	21 28.6 -7.6	52 52.0%
Dark Eyes	2	14 21.6 -7.6	34 26.4 7.6	48 48.0%
	Column Total	45 45.0%	55 55.0%	100 100.0%

Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F.< 5
8.16013	1	.0043	21.600	None
9.34991	1	.0022	(Before Yates Correction)	

Number of Missing Observations = 0

```
=====================
= Oneway ANOVA test =
=====================
```

Assuming that you are comfortable with entering the data using the "review" editor you can go directly to the Oneway ANOVA test routine. The following is the command file called gpa.dat.

```
DATA LIST
     / Group          1
       GPA          3-6.

variable labels
     Group       "Socioeconomic Group"
     GPA         "Grade Point Average".

value labels
     Group 1 '<= $15,000'
           2 '>  $15,000 <= $25,000'
           3 '>  $25,000 <= $35,000'
           4 '>  $35,000 <= $45,000'.

begin data.
1 2.87
1 2.16
1 3.14
1 2.51
1 1.80
```

```
1 3.01
1 2.16
2 3.23
2 3.45
2 3.67
2 2.78
2 3.77
3 2.61
3 3.56
3 2.97
3 2.33
3 3.64
3 2.67
3 3.31
3 3.01
4 2.25
4 3.13
4 2.44
4 3.27
4 2.81
4 1.36
4 2.70
4 2.41
end data.
```

Step 1, type:

```
A> b:student          << This runs the SPSS/PC+ >>
                      << Studentware program.   >>
```

Step 2, type:

```
SPSS/PC:include 'gpa.dat'.
                      << This reads in the command >>
                      << file called gpa.dat that  >>
                      << was previously created.   >>
```

At this point, the system will give some messages. After the messages end go to step 3.

Step 3, type:

```
SPSS/PC:oneway GPA by Group(1,4) /ranges = btukey.
                    << This executes the oneway       >>
                    << ANOVA test. "GPA" and "Group" >>
                    << indicates variable names.      >>
```

At this point, the system will ask for the C3 diskette.

Step 4:

Place the C3 disk in drive B, press the return key.

The result will be saved into the file called spss.lis. (Press the space bar when MORE shows at the top of the screen).

Step 5, type:

```
SPSS/PC:finish    << This is the command to exit >>
                  << SPSS/PC+ Studentware.       >>
```

You are now back to the DOS prompt.

Step 6, type:

```
A> rename spss.lis gpa.lis
```

This will change the file name from spss.lis to gpa.lis. Otherwise you may lose your previous work when you go into SPSS/PC+ Studentware again.

Step 7, type:

```
A> type gpa.lis
```

You have finished Oneway ANOVA test routine. The following is the result for this example.

```
- - - - - - - - - - - O N E W A Y - - - - - - - - - - -

   Variable  GPA        Grade Point Average
By Variable  GROUP      Socioeconomic Group

                        Analysis of Variance
```

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	3.0878	1.0293	4.0103	.0190
Within Groups	24	6.1598	.2567		
Total	27	9.2477			

- - - - - - - - - - O N E W A Y - - - - - - - - - -

Variable GPA Grade Point Average
By Variable GROUP Socioeconomic Group

Multiple Range Test

Tukey-B Procedure
Ranges for the .050 level -

3.41 3.71 3.90

The ranges above are table ranges.
The value actually compared with Mean(J)-Mean(I) is..
.3582 * Range * Sqrt(1/N(I) + 1/N(J))

(*) Denotes pairs of groups significantly different at the .050 level

- - - - - - - - - - O N E W A Y - - - - - - - - - -

Variable GPA Grade Point Average
(Continued)

Mean	Group	Grp 1	Grp 4	Grp 3	Grp 2
2.5214	Grp 1				
2.5463	Grp 4				
3.0125	Grp 3				
3.3800	Grp 2	*	*		

= Twoway ANOVA test =

Assuming that you are comfortable with entering the data using the "review" editor you can go directly to the Twoway ANOVA test routine. To help you visualize this example, data are organized as:

Variety 1			Variety 2		
Plot1	Plot2	Plot3	Plot1	Plot2	Plot3
3	2	1	4	2	3
5	6	4	4	7	4
6	6	5	5	8	6
8	9	9	6	4	7
7	5	9	9	9	9

The following is the command file called corn.dat.

```
DATA LIST
     / Variety      1
       Plot         3
       Yield        5.

begin data.
1 1 3
1 1 5
1 1 6
1 1 8
1 1 7
1 2 2
1 2 6
1 2 6
1 2 9
1 2 5
1 3 1
1 3 4
1 3 5
1 3 9
1 3 9
2 1 4
2 1 4
2 1 5
2 1 6
2 1 9
```

```
2 2 2
2 2 7
2 2 8
2 2 4
2 2 9
2 3 3
2 3 4
2 3 6
2 3 9
2 3 9
end data.
```

Step 1, type:

```
A> b:student          << This runs the SPSS/PC+ >>
                      << Studentware program.   >>
```

Step 2, type:

```
SPSS/PC:include 'corn.dat'.
                          << This reads in the command >>
                          << file called corn.dat that >>
                          << was previously created.   >>
```

At this point, the system will give some messages. After the messages end go to step 3.

Step 3, type:

```
SPSS/PC:anova Yield by Variety(1,2) Plot(1,3).
                        << This executes the twoway >>
                        << ANOVA test.              >>
```

At this point, the system will ask for the C3 diskette.

Step 4:

Place the C3 disk in drive B, press the return key.

The result will be saved into the file called spss.lis. (Press the space bar when MORE shows at the top of the screen).

Step 5, type:

```
SPSS/PC:finish    << This is the command to exit >>
                  << SPSS/PC+ Studentware.       >>
```

You are now back to the DOS prompt.

Step 6, type:

A> rename spss.lis corn.lis

This will change the file name from spss.lis to corn.lis. Otherwise you may lose your previous work when you go into SPSS/PC+ Studentware again.

Step 7, type:

A> type corn.lis

You have finished the Twoway ANOVA test routine. The following is the result for this example.

* * * A N A L Y S I S O F V A R I A N C E * * *

BY YIELD
VARIETY
PLOT

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Main Effects	.733	3	.244	.035	.991
VARIETY	.533	1	.533	.076	.786
PLOT	.200	2	.100	.014	.986
2-way Interactions	.867	2	.433	.061	.941
VARIETY PLOT	.867	2	.433	.061	.941
Explained	1.600	5	.320	.045	.999
Residual	169.200	24	7.050		

```
Total                    170.800     29       5.890

     30 Cases were processed.
      0 Cases (    .0 PCT) were missing.
```

```
================================================
= Install SPSS/PC+ Studentware on a hard disk =
================================================
```

In the root directory you must have a file called config.sys and it should contain a line that reads:

```
FILES=20
```

If it does not, edit it with "review" or some other editor.

Step 1, type:

```
C> mkdir SPSS    << This creates a subdirectory >>
                 << called SPSS.                >>
```

Step 2,

Place the C1 diskette into drive A.

Step 3, type:

```
C> a:install a: c:\SPSS
```

After you install the C1 disk the system will give you messages about the other disks. Follow the instructions on the screen. You have finished the installation routine.

REFERENCES

McClave, J. T., & Dietrich, F. H. (1985). Statistics (3rd ed.). San Francisco, California, Dellen Publishing Company. ISBN 0-02-378760-0

Norusis, M. (1988). SPSS/PC+ Studentware. Chicago, Illinois, SPSS Incorporated. ISBN 0-918469-73-2